Exhibit K – Part 4

'876 Patent Anticipated or Rendered Obvious by "Programmed Pulsewidth Modulated Waveforms for Electromagnetic Interference Mitigation in DC-DC Converters," by Wang and Sanders, *IEEE Transactions on Power Electronics*, Oct. 1993

'876 Patent Claims	Anticipated or Rendered Obvious
1. A digital frequency jittering circuit for varying the switching frequency of a power supply, comprising:	Wang teaches a digital frequency jittering circuit for varying the switching frequency of a power supply. Abstract: "In this paper, a method to generate an optimal programmed switching waveform for a dc-dc converter is presented. This switching waveform is optimized to reduce the amplitude of harmonic peaks in the EMI generated by the converter." P. 596: "The main approaches considered in this paper rely on the fact that it is possible to operate a PWM type power circuit with a time-varying switching frequency provided the average duty cycle is not disturbed. We employ a programmed waveform that repeats itself after *K* cycles. A typical programmed PWM waveform and its spectrum is illustrated in Fig. 1(b). Compared to regular PWM, the programmed PWM has a harmonic spacing that is smaller by a factor of *K*. The extra available harmonic frequencies are used to spread out the spectral energy of a given circuit waveform. Section II of the paper reviews the main techniques considered in the literature. Sections III and IV illustrate the application of these methods in the context of a dc-dc converter."
an oscillator for generating a signal having a switching frequency, the oscillator having a control input for varying the switching frequency;	Fig. 20 teaches an oscillator for generating a signal having a switching frequency PWM OUT, the oscillator having a control input "ramp slope" for varying the switching frequency P. 603-604: "A full implementation of the programmed waveform generator with a continuous control input can be based on a programmable triangle waveform generator. Two numbers are stored for every subperiod. One controls the slope of the triangle waveform, and therefore, the length of the subperiod. The other is added to the control signal, and therefore changes the duty ratio of a given subperiod from the average. The important waveforms and the resulting programmed PWM output are shown in Fig. 19. A block diagram implementation is shown in Fig. 20. Note that the average duty cycle can be varied linearly with the standard duty ratio control signal, marked $V_{CONTROL}$ in Fig. 19. However, the linear range is smaller than with regular PWM in this implementation because of the variation in the D_k's."
a digital to analog converter	Figure 20 teaches a digital to analog converter coupled to the

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coupled to the control input for varying the switching frequency; and	control input "ramp slope" for varying the switching frequency.
a counter coupled to the output of the oscillator and to the digital to analog converter, the counter causing the digital to analog converter to adjust the control input and to vary the switching frequency.	Figure 20 teaches a counter coupled to the output of the oscillator and to the digital to analog converter, the counter causing the digital to analog converter to adjust the control input "ramp slope" and to vary the switching frequency PWM OUT. Figure 19 shows the change in switching frequency.
17. A method for generating a switching frequency in a power conversion system, comprising:	It is inherent or would be obvious to show a method for generating a switching frequency in a power conversion system, comprising:
generating a primary voltage;	It is inherent or would be obvious to show generating a primary voltage;
cycling one or more secondary voltage sources to generate a secondary voltage which varies over time; and	It is inherent or would be obvious to show cycling one or more secondary voltage sources to generate a secondary voltage which varies over time; and
combining the secondary voltage with the primary voltage to be received at a control input of a voltage-controlled oscillator for generating a switching frequency which is varied over time.	It is inherent or would be obvious to show combining the secondary voltage with the primary voltage to be received at a control input of a voltage-controlled oscillator for generating a switching frequency which is varied over time.
18. The method of claim 17 further comprising clocking a counter with the output of the oscillator.	It is inherent or would be obvious to show further comprising clocking a counter with the output of the oscillator.
19. The method of claim 17 wherein the primary voltage is V and each of the secondary voltage sources generates a supplemental voltage lower than V, further comprising passing the supplemental voltage to the voltage-controlled oscillator.	It is inherent or would be obvious to show the primary voltage is V and each of the secondary voltage sources generates a supplemental voltage lower than V, further comprising passing the supplemental voltage to the voltage-controlled oscillator.

'876 Patent Anticipated or Rendered Obvious by "Acoustic Noise Reduction in Sinusoidal PWM Drives Using a Randomly Modulated Carrier," by Habetler and Divan, *IEEE Transactions on Power Electronics*, July 1991 ("Habetler")

'876 Patent Claims	Anticipated or Rendered Obvious
1. A digital frequency jittering circuit for varying the switching frequency of a power supply, comprising:	Habetler teaches a digital frequency jittering circuit for varying the switching frequency of a power supply. Abstract: "Acoustic noise in an inverter-driven electric machine can be reduced by avoiding the concentration of harmonic energy in distinct tones. One method to spread out the harmonic spectrum without the use of programmed PWM is to cause the switching pattern to be random. It is proposed that the switching pattern can be randomized by modulating the triangle carrier in sinusoidal PWM with band-limited white noise." pp. 361-362, Conclusion: "It is proposed that an effective method of spreading the spectral content of the applied voltage is by randomly modulating the triangle carrier in sinusoidal PWM. In this way, the energy in the tones around the switching frequency is spread out with subsequent reduction in peak values. The random modulator maintains the advantages of sinusoidal PWM including constant average switching frequency, linear amplification, and real-time control. The instantaneous switching frequency variation is small and can be predetermined. With the proposed scheme, the total level of the acoustic noise emitted by the machine remains constant. The acoustic noise, however, is more pleasing to the ear since the noise is now random. Experimental results illustrate the absence of tones in the voltage applied to an induction machine and in the spectrum of the acoustic noise generated by the machine."
an oscillator for generating a signal having a switching frequency, the oscillator having a control input for varying the switching frequency;	Figure 5 shows an oscillator as a "Triangle Generator." The Triangle Generator generates a signal with a switching frequency. An input to the Triangle Generator varies the switching frequency. p. 359: "Fig. 5 shows another method for implementing the random carrier PWM regulator. In this approach the band limited noise generator is implemented using a lookup table, whose contents have been generated apriori, off line. That is, a large quantity of periodic random numbers can be computer generated and stored in some type of ROM. If the quantity of numbers is large, the repetition rate of the random numbers can be made large say, greater than one second, and will have

'876 Patent Claims	Anticipated or Rendered Obvious
	no effect on the resulting voltage spectra. The output of the ROM is then sent through a digital to analog converter to get the slope of the triangle wave."
a digital to analog converter coupled to the control input for varying the switching frequency; and	Figure 5 shows a block labeled "A/D" coupled to the input of the triangle generator for varying the switching frequency of the triangle wave by varying the slope of the triangle wave. This "A/D" block is a digital to analog converter that converts a digital signal received from the EPROM into an analog signal. "The output of the ROM is then sent through a digital to analog converter to get the slope of the triangle wave." p. 359.
a counter coupled to the output of the oscillator and to the digital to analog converter, the counter causing the digital to analog converter to adjust the control input and to vary the switching frequency.	Figure 5 shows a counter coupled to the output of the triangle oscillator and to the block labeled "A/D", which is a digital to analog converter. The counter causes the digital to analog converter to adjust the control input and vary the switching frequency.
17. A method for generating a switching frequency in a power conversion system, comprising:	If claim 17 is enabled, it is anticipated by Habetler. Habetler teaches a method for generating a switching frequency in a power conversion system.
generating a primary voltage;	Habetler teaches generating a primary voltage, which is labeled "primary slope" in Figure 5.
cycling one or more secondary voltage sources to generate a secondary voltage which varies over time; and	Habetler teaches cycling one or more secondary voltage sources to generate a secondary voltage, which is the output of the "A/D" block. This secondary voltage varies over time.
combining the secondary voltage with the primary voltage to be received at a control input of a voltage-controlled oscillator for generating a switching frequency which is varied over time.	As shown in Figure 5, Habetler teaches that the secondary voltage is combined with the primary voltage at a voltage summer at the control input of the voltage controlled oscillator to generate a switching frequency that is varied over time.
18. The method of claim 17 further comprising clocking a counter with the output of the oscillator.	If claim 17 is enabled, then claim 18 is anticipated by Habetler. As shown in Figure 5, Habetler teaches clocking a counter with the output of the oscillator.
19. The method of claim 17 wherein the primary voltage is	If claim 17 is enabled, then claim 19 is anticipated by Habetler. As shown in Figure 6, Habetler teaches that the

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V and each of the secondary voltage sources generates a supplemental voltage lower than V, further comprising passing the supplemental voltage to the voltage-controlled oscillator.	supplemental voltages generated by the secondary voltage sources are lower than the primary voltage. "The triangle carrier and the line switching function are shown in Fig. 6. Note that there is very little perceivable difference in the triangle wave with and without random modulation, since the instantaneous frequency is varying only slightly." p. 359. The supplemental voltage is passed to the voltage-controlled oscillator.

'876 Patent Anticipated or Rendered Obvious by US Patent No. 4,638,417 ("Martin")

'876 Patent Claims	Anticipated or Rendered Obvious
1. A digital frequency jittering circuit for varying the switching frequency of a power supply, comprising:	Martin discloses a digital power density spectrum controller for a power supply regulator. This is equivalent to a digital frequency jittering circuit.
an oscillator for generating a signal having a switching frequency, the oscillator having a control input for varying the switching frequency;	Martin shows one figure in which there is a voltage controlled oscillator (VCO). A control input to the VCO comes from the D/A and varies its frequency.
a digital to analog converter coupled to the control input for varying the switching frequency; and	A D/A block is shown coupled to the oscillator for varying the switching frequency.
a counter coupled to the output of the oscillator and to the digital to analog converter, the counter causing the digital to analog converter to adjust the control input and to vary the switching frequency.	A counter is coupled to the output of the oscillator and to the D/A via an EPROM. As the counter counts, it addresses different digital codes in the EPROM. The D/A converts the digital code out of the EPROM and generates an analog control signal that varies the oscillator frequency and, hence, the switching frequency.
17. A method for generating a switching frequency in a power conversion system, comprising:	If claim 17 is enabled, it would be anticipated or rendered obvious by Martin.
generating a primary voltage;	It is inherent or would be obvious to have a primary voltage that is used for generating a switching frequency in a power conversion system. For example, any bias voltage within an oscillator may be viewed as being a primary voltage.
cycling one or more secondary voltage sources to generate a secondary voltage which varies over time; and	It is inherent or would be obvious that Martin's D/A converter would contain (or internally generate) one more secondary voltage sources. The counter coupled to the EPROM cycles through these secondary voltage sources to such that a secondary voltage within the D/A converter varies over time.
combining the secondary voltage with the primary voltage to be received at a control input of a voltage-controlled oscillator for generating a switching frequency which is varied over time.	It is inherent or would be obvious to combine two voltages, e.g., using an amplifier-based voltage summer, to create a control voltage that would control the VCO for generating a switching frequency which varies over time. If the claim can be read such that Martin shows the secondary voltage is a time-varying voltage within the D/A converter, it is inherent or would be obvious to

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	combine it with a primary voltage to generate a control input for the voltage-controlled oscillator for generating a switching frequency which is varied over time.
18. The method of claim 17 further comprising clocking a counter with the output of the oscillator.	If claim 17 is enabled, claim 18 would be anticipated or rendered obvious by Martin. Martin anticipates or renders obvious the method of Claim 17 and shows a method for clocking a counter with the output of the oscillator in the figure.
19. The method of claim 17 wherein the primary voltage is V and each of the secondary voltage sources generates a supplemental voltage lower than V, further comprising passing the supplemental voltage to the voltage-controlled oscillator.	If claim 17 is enabled, claim 19 would be anticipated or rendered obvious by Martin. Martin anticipates or renders obvious the method of Claim 17. If the claim can be read such that Martin shows that its D/A converter has a primary voltage (of the largest value) with secondary voltages (or sources of voltage) lower than the primary, it is inherent or would be obvious to generate a supplemental voltage from the secondary voltage sources and pass this supplemental voltage to the voltage-controlled oscillator.